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Multivariate faunal analyses of the Turonian Bissekty Formation: Variation in the degree of marine influence in temporally and spatially averaged fossil assemblages

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ABSTRACT

The Bissekty Formation, exposed on the Dzharakuduk escarpment (Kyzylkum Desert) in Uzbekistan, contains the richest and most abundant Turonian terrestrial fauna known from Eurasia. This study utilizes ordination analyses to identify spatial or temporal patterns (i.e., biofacies) in the distribution of spatially averaged skeletal elements (i.e., mix of unequivocally marine faunal elements with terrestrial ones) within the laterally extensive intraformational conglomerates (IFCs) of the Bissekty Formation. Ordination analyses were used to determine similarities among the IFCs based on their absolute taxonomic abundance and presence or absence. To determine the primary factor(s) driving the ordination pattern, taxonomic abundance, richness, environmental restrictions (aquatic, semi-aquatic, and terrestrial), and skeletal element size were examined. Relative Sørensen and Sørensen in combination with Euclidean and city block metrics were used in the analysis and results were consistent across methodologies. Ordination patterns were driven by aquatic taxa, which were dominated in abundance and richness by marine and brackish-tolerant taxa. By mapping the abundance of terrestrial, semi-aquatic, and aquatic taxa of individual IFCs onto ordination space, the relative position of the coastline with reference to the Dzharakuduk escarpment during the deposition of the Bissekty Formation can be inferred. These results indicate that ordination analyses are useful tools for examining taphonomically biased samples and should be utilized more frequently in vertebrate studies.